

High Thermally Conductive and Electrically Insulative Thermal Interface Materials, Phase I

Completed Technology Project (2018 - 2019)



Project Introduction

Continued development of electronic systems demands new thermal management technology to dissipate high thermal heat loads that can have deleterious effects on electronics' performance and reliability. In particular, as electronic devices continue to shrink in size, heat loads proportionally increase along with the potential for cross-talk. Aluminum nitride based thermal interface materials will be produced in this project that can be applied as a paste or coating for passively cooling electronics with high heat fluxes. These materials will be produced and measured to show thermal conductivities greater than 10 W/m-K. Applications for thermal interface materials in electronics are extensive. For example, with continued developments in electronics' technology and a marked increase in the production of miniaturized microprocessors, the demand for electronic thermal management devices is on the rise. The global market for thermal management products is expected to grow from \$10.6 billion in 2014 to \$14.7 billion in 2019. This is a compound annual growth rate of 6.8% between 2014 and 2019 where thermal interface materials are expected to garner 10% of this market. Accordingly, the 2019 market for thermal technology materials is \$1.5 billion on the broad scale.

Anticipated Benefits

NASA electronics designers need new thermal interface materials that are thermally conductivity, yet electrically insulative that can function as adhesives, pastes, underfills, and coatings for cooling electronic components and systems. These aluminum nitride based thermal interface materials will help dissipate high heat loads helping to increase the electronics reliability and lifetime for NASAs spacecraft and platforms.

With new market drivers that include vehicle electrification, battery technologies and energy storage, wind turbines, data centers, solar power conversion, and electrical transmission, advanced thermal management technologies such as Skyhaven's AlN thermal interface materials are needed.



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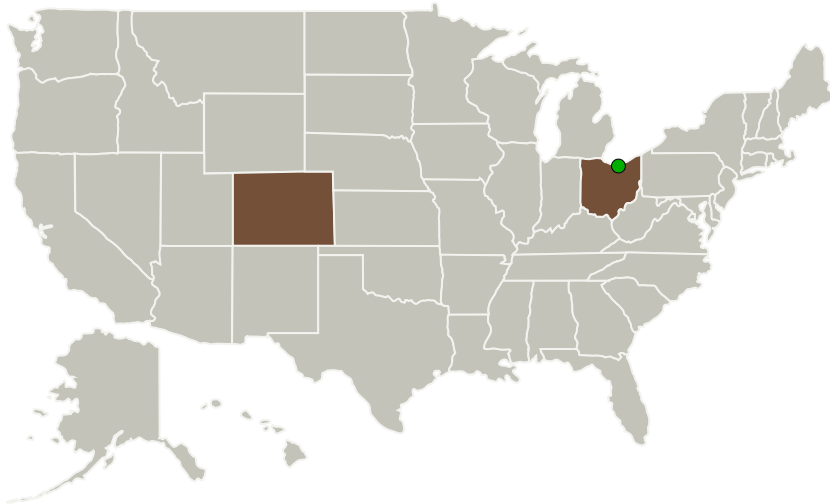
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Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|-------------------------------|-------------------------|-------------|-----------------------------|
| Skyhaven Systems, LLC | Lead Organization | Industry | Steamboat Springs, Colorado |
| ● Glenn Research Center(GRC) | Supporting Organization | NASA Center | Cleveland, Ohio |

Primary U.S. Work Locations

| | |
|----------|------|
| Colorado | Ohio |
|----------|------|

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/141087>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Skyhaven Systems, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

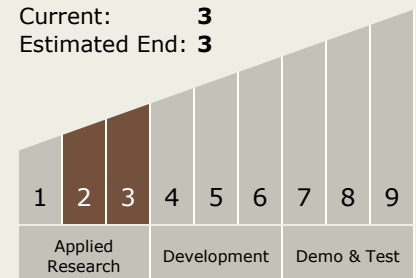
Carlos Torrez

Principal Investigator:

Michael C Kimble

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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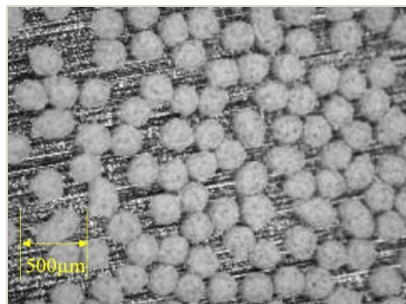
Images



Briefing Chart Image

High Thermally Conductive and Electrically Insulative Thermal Interface Materials, Phase I

(<https://techport.nasa.gov/image/125969>)



Final Summary Chart Image

High Thermally Conductive and Electrically Insulative Thermal Interface Materials, Phase I

(<https://techport.nasa.gov/image/130550>)

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.1 Power Generation and Energy Conversion
 - └ TX03.1.4 Dynamic Energy Conversion

Target Destinations

Earth, Mars, Others Inside the Solar System